Serial No. - 09/807,485
Art Unit - 2831

Amendments to the Specification

Please replace paragraph 4, found on page 1, line 25 through page 6, line 3, with the following amended paragraph:

A high capacitance energy storage device where electrodes are formed of layers of a ~~carbonised~~ carbonized, activated woven fabric that has been impregnated with an electrolyte. The electrolyte is absorbed by active centers at the surface of the ~~carbonised~~ carbonized, activated material. The prepared fabric is sandwiched between alternating graphite-based separators and non-conductive membranes to form a capacitor structure exhibiting very high capacitance, non-degradation over multiple charging/discharging cycles, and, in AC installations, reliable and reproducible characteristics. In addition, the materials in the device are environmentally friendly.

Please replace paragraphs 6-8, found on page 2, lines 7-27 with the following amended paragraphs:

A high capacitance energy storage device where electrodes are formed of layers of a ~~carbonised~~ carbonized, activated woven fabric that has been impregnated with an electrolyte. The electrolyte is absorbed by active centers at the surface of the ~~carbonised~~ carbonized, activated material. The prepared fabric is sandwiched between alternating graphite-based separators and non-conductive membranes to form a capacitor structure exhibiting very high capacitance, non-degradation over multiple charging/discharging cycles, and, in AC installations, reliable and reproducible characteristics. In addition, the materials in the device are environmentally friendly.

In an embodiment of the present invention, there is provided a high capacitance energy storage device. The device consist of a housing that is electrically isolated from, and lined with, conductive, chemically inert separators. The separators are, in turn, electrically connected to contacts mounted on the housing. At least one capacitive cell is contained within the housing. Each capacitive cell has a first electrode separated from a second electrode by a non-conductive, chemically inert membrane. The electrodes are formed of a ~~carbonised~~ carbonized and activated woven fabric impregnated with an

electrolyte, the molecules of which can freely pass through the membrane. The cell is in electrical and mechanical contact with the separators.

In a further aspect, there is provided a capacitive cell for a high energy storage device. The cell consists of a first electrode separated from a second electrode by a non-conductive, chemically inert membrane. The electrodes are formed of a ~~carbonised~~ carbonized, activated woven fabric impregnated with an electrolyte. The chemically inert membrane permits free passage of molecules of said electrolyte therethrough.

Please replace paragraph 14, found on page 3, lines 22-33 with the following amended paragraph:

Cell 14 consists of electrodes 20, 22 separated by a non-conductive, chemically inert membrane 24. The non-conductive, chemically inert membrane can be chosen from a wide selection of materials, provided they are transparent to the electrolyte particles. Suitable materials include: mipor, miplast, cellulose or paper-based sheets, and perforated polymer films, such as polyethylene, polystyrole and fluoroplast. The membrane 24 is transparent to the molecules of the electrolyte to permit the free passage of the molecules therethrough under the influence of an applied voltage. In a presently preferred embodiment, ~~sulphuric~~ sulfuric acid in a water solution has been found to be a suitable electrolyte, but the present inventors contemplate that other electrolytes, as are known to those skilled in the art, can be employed. Generally, any electrolytic liquid, liquid mixture, sol/gel, etc. whose molecules initially have a non-uniform electron density, is applicable. It has been found that if the electrolyte is ionic, the effect of the charge redistribution at the time of charging device 10 is be more efficient.

Please replace paragraphs 16, found on page 4, lines 6-28 with the following amended paragraphs:

Electrodes 20, 22 are made of a regularly structured organic substance, such as material woven from hydrocellulose. The hydrocellulose material is ~~carbonised~~ carbonized, and activated, or charged. Suitable woven materials are presently available for use as charged filters and, in the medical field, to cover wounds. ~~Carbonisation~~

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Carbonization is conducted for the purpose of producing chemically inert materials from the organic substance. Activation creates a porous structure with active centres. A method of producing such materials is described in Russian Federation Patent No. 2000360, dated January 22, 1992. In a currently preferred embodiment, the inventors of the present invention have successfully employed UVIS-AC cloth, manufactured by UVICOM, but other similar materials can be used as well. Generally, the ~~carbonised~~ carbonized, activated material should exhibit a specific surface area of 800 - 2000 m^2/g, a total porosity of 0.25 - 0.80 cm^3/g, and surface density of 100- 300 g/m^2, and should contain little or no ash.

In a preferred embodiment, the electrodes 20, 22 are made of a woven fabric with a regular structure. The fabric is ~~carbonised~~ carbonized and activated, as described above. An electrolyte, such as ~~sulphuric~~ sulfuric acid in solution, is impregnated onto the ~~carbonised~~ carbonized activated electrode fabric. The electrolyte can be any liquid, the molecules of which will have a non-uniform electron density when absorbed into the active centers on the ~~carbonised~~ carbonized, activated fabric, or when an electric field is applied. The impregnation of the electrolyte is a presently believed to be purely physical absorption, and a free volume of the electrolyte is absent once absorbed. The electrolyte is mainly absorbed on electrodes 20, 22 and non conductive inert transparent membrane 24. The electrolyte is a solution, mixture or a pure substance assisted by electrodes 20, 22 possessing active centres, in particular, carbonyl, carboxyl, hydroxyl and other groups. Generally, the impregnated electrodes 20, 22 exhibit characteristics of a solid body, as opposed to a non-Newtonian fluid as in the prior art.

Please replace paragraph 19, found on page 5, lines 5-16 with the following amended paragraphs:

As will be apparent, the absorption of the electrolyte into the ~~carbonised~~ carbonized, activated woven fabric forms a generally solid, chemically indifferent electrode/electrolyte interface. At the very surface of the electrodes there is, in fact, a two phase, ie. solid/liquid surface. This has the advantage of dispensing with electrochemical reactions between the electrodes and electrolyte during charging and

discharging, as is found in prior art high capacitance capacitors and batteries. It is believed that the absence of electrochemical reactions at the interface results from the low voltage at which device 10 can operate. The nominal operating voltage for device 10 is less than that which causes a reaction to occur. For example, if the disassociation voltage for water is 1.24 V, then device 10 is operated at a voltage below 1.24 V to prevent disassociation. Likewise, if the chosen electrolyte is ~~sulphuric~~ sulfuric acid in a water solution (with a disassociation voltage of 1.67V) then device 10 is optimally operated at voltages below 1.67V.

Please replace paragraphs 26 and 27, found on page 6, line 26 through page 7, line 8, with the following amended paragraphs:

As an example of a high capacitance energy storage device according to the present invention, the inventors of the present invention have constructed a high capacitance energy storage device consisting of three 2 V units, each unit consisting of a pair of cells connected in series, as shown in Fig. 3. The device was built to resemble the standard case of a 6V chemical battery, IEC4R25. Each unit had dimensions 62x62x30 mm, giving a volume of 110 cm^3 and a mass of 105 gm. The electrodes of each cell were formed of 18 layers of the carbon impregnated woven material, such that each 2V unit consists of 72 layers of the ~~carbonised~~ carbonized activated material, and the total electrode volume was 43 cm^3 (44x44x22 mm) with a mass of 95 gm.

The device was charged over an extended period, until the charging current was less than 1mA. Once charged, each of the three capacitive cells exhibited a capacitance of 700 F∀10%, supplying an energy equal to 1400 J, at 2V. The electrolyte chosen consisted of ~~sulphuric~~ sulfuric acid in a water solution. The specific energy, excluding the mass and volume of the housing, for the device was 32 J/cm^3 or 15 J/gm, with an effective output, including the mass and volume of the housing, measured at 12 J/cm^3 or 7 J/gm.